



Public Service Commission of Wisconsin Office
of Energy Innovation
Critical Infrastructure Microgrid and
Community Resilience Center Pilot Grant
Program



ATTACHMENT A - COVER SHEET

SECTION I - Provide information summarizing the project proposal.				
Project Title:		Advocate Aurora Pleasant Prairie Microgrid Feasibility Study		
PSC Grant Request (\$):		Applicant Cost Share (\$):		Project Total (\$):
\$35,000		\$22,500		\$57,500
Choose one Eligible Activity				
<input checked="" type="checkbox"/> Critical Infrastructure Microgrid Feasibility Study Level 1 and 2		<input type="checkbox"/> Critical Infrastructure Microgrid Feasibility Study Level 3		<input type="checkbox"/> Community Resilience Center Feasibility Study
SECTION II - Provide information for your organization, signatory, and primary contact for the project.				
Applicant Type:		<input type="checkbox"/> City	<input type="checkbox"/> Village	<input type="checkbox"/> Town
<input type="checkbox"/> County		<input type="checkbox"/> Tribal Nation		
<input type="checkbox"/> Wisconsin Technical College System		<input type="checkbox"/> University of Wisconsin System		
<input type="checkbox"/> K-12 School District		<input type="checkbox"/> 501(c)(3) nonprofit		
<input type="checkbox"/> Municipal Utility (water, wastewater, electric, natural gas)		<input checked="" type="checkbox"/> Hospital (public or nonprofit)		
Name (on W-9):		Aurora Health Care, Inc.		
Address (on W-9):		C/O Accounting Department P.O. BOX 341880 Milwaukee, WI		
County or Counties Served by Project:		Kenosha County		
DUNS Number or CAGE Code:		130185960		
NAICS Code:		622110		
Authorized Representative/Signatory (Person authorized to submit applications and sign contracts)			Primary Contact (if different from Authorized Representative)	
Name: Jedd Winkler			Name: Jedd Winkler	
Title: Energy Program Manager			Title:	
Phone: 414-219-7118			Phone:	
E-mail: Jedd.winkler@aah.org			E-mail:	
Signature of the Authorized Representative			8/5/21	

Advocate Aurora Health

PLEASANT PRAIRIE MICROGRID FEASIBILITY STUDY

Summary of Project Budget				
Line	Description	PSC Grant Request	Applicant Cost Share	Total Project Cost
1	Personnel		\$7,500	\$7,500
2	Fringe			\$0
5	Travel			\$0
6	Contractual	\$35,000	\$15,000	\$50,000
7	Other			\$0
8	Indirect			\$0
Totals		\$35,000	\$22,500	\$57,500
% of Total		61%	39%	

Applicant Comments: The contractual amount is the dollar amount that will be used for our engineering consultant to perform the technical aspects of the feasibility study. The personnel cost share accounts for the Aurora internal labor that will be dedicated to the project for things including project management, administration, contract oversight, collection of relevant documents and drawings, user interviews and participation with the feasibility study.



ADVOCATE AURORA PLEASANT PRAIRIE MICROGRID FEASIBILITY STUDY PROPOSAL

SUBMITTED THROUGH THE PSC WISCONSIN AND THE OFFICE OF ENERGY INNOVATION'S
"CRITICAL INFRASTRUCTURE MICROGRID & COMMUNITY RESILIENCE CENTER PILOT
GRANT PROGRAM"

DOCKET ID: 9705-FG-2020



August 5th, 2021

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3.3 APPLICATION NARRATIVE

Aurora Health Care is a private not for profit integrated health care provider. Aurora Health Care has the privilege of serving over 30 counties and encompassing 90 communities in Wisconsin. Our facility fleet includes 16 hospitals, more than 150 clinics, and 70 pharmacies. 38,000 team members and 1.2 million unique patients are part of Aurora Health Care.

AURORA COMMITMENT TO SUSTAINABILITY

Advocate Aurora has made a pledge to offset its health care operation with 100% renewable electricity by 2030. As part of our focus on sustainability, building performance and patient care, Aurora Health Care Facilities Operations team participates with our state and national professional organization, the American Society of Healthcare Engineers (ASHE), Energy to Care program. The goal of this program is to direct energy savings dollars to activities that support direct patient care. Aurora Health Care has been awarded in multiple years at multiple satellite sites ASHE Energy to Care awards for reduction in building usage intensity (award threshold is 10% reduction year over year).

Additionally, Aurora Health Care has had nine of the hospital facilities operating in Wisconsin EnergyStar certified. This is more facilities than any other health care provider operating in the state. ENERGY STAR certified buildings and plants are verified to perform in the top 25 percent of buildings nationwide, based on weather-normalized source energy performance and many other metrics, including occupancy, hours of operation, and more. ENERGY STAR is the only environmental program in the United States that certifies energy efficiency based on actual, verified energy performance and objective measures of performance, providing a guarantee of savings.

As part of our longer-term energy goals, Aurora is evaluating expansion of its on-site renewable generation throughout the state. This proposed study would enable us to further study how a local microgrid at Pleasant Prairie can support our facilities resilience and sustainability.

As we continue to build new facilities throughout the state, this study will help us to think critically on how we can use health care code required emergency generators and backup power systems to integrate into a resilient and green microgrids.

Additionally, this study includes some scope to study how we can move away from natural gas as a space heating fuel towards carbon free sources such as green hydrogen. We believe decarbonizing our space heating processes represent one of the most significant challenges of emissions reductions and will require innovative technology to solve. This grant would enable us to explore these opportunities for our Pleasant Prairie site and apply the lessons learned more broadly.

PROJECT DESCRIPTION

The Aurora Health Center Pleasant Prairie is a 200,000 sq-ft health care complex that includes a same day surgery center and medical office building serving both adults and children. The building is located at 12500 Aurora Dr. Pleasant Prairie and opened in 2020. The facility provides health care service to adults and children in Kenosha, Racine and Lake county areas.

As the Kenosha County I-94 corridor continues to expand through area development, the health care complex is designed to expand to a full hospital campus, including a patient bed tower. This proposed

feasibility study will evaluate the potential to implement a microgrid system as part of the next phase of the hospital complex buildout. The proposed microgrid will include a combination of technologies including onsite solar PV, battery storage, fossil-based emergency generators and integration with existing electrical infrastructure. The study will also evaluate the option to include a combined heat and power (CHP) system as part of the microgrid. The potential to power the boilers or generators by hydrogen will be evaluated to future proof the installation.

The intent is that the microgrid system is to provide pre-disaster mitigation, achieve a higher level of reliability through a more diverse and modern technologies available, expand the amount of load available to be served in outage situations and reduce and normalize buildings load needs on local transmission and distribution to reduce utility costs.

REFERENCE MATERIALS LIST

The list below identifies the reference material that is included with this grant application to assist the readers in understanding the scope of the project.

- 1.) Site satellite view
- 2.) Site plan
- 3.) Site Electrical 1-line
- 4.) Utility letter of support
- 5.) HGA Qualifications
- 6.) muGrid Qualifications

A reference list is also located in section 3.5 per the grant application instruction. That list is a duplicate of this one.

3.4 MERIT REVIEW CRITERIA

3.4.1 IDENTIFICATION OF CRITICAL INFRASTRUCTURE

The Pleasant Prairie Health Complex is a critical infrastructure facility as it provides health care services to the community including surgeries and other complex medical care. The loss or incapacity of this critical infrastructure would have a debilitating impact on the surrounding areas public health, safety and well-being. As the facility continues to grow and develop into a full hospital campus, there will also likely be a trauma center whose operation would be critical after a large disaster or other emergency event.

The current facility includes 2- 600kW diesel fueled generators that are used to back-up the facility emergency circuits. As part of this study, the consultant will evaluate how these units could be incorporated into the proposed microgrid and what required modification to the existing electrical infrastructure would be required to operate a true microgrid that can be utilized to power the entire facility during an extended grid outage.

Figure 1: Existing Generator Infrastructure



3.4.2 KEY PARTNERS AND STAKEHOLDERS

The project key partners and stakeholders are identified in the table below. The Aurora team will be led by Jedd Winkler, energy program manager. James Nash will be the Aurora facilities operation representative.

HGA Architects and Engineers will be the lead consultant on the project. HGA was the original architect and engineer for the original facility and has worked extensively with health care backup systems and microgrids.

muGrid Analytics will be performing the system sizing analysis and the financial analysis. muGrid is an industry leader in modeling of microgrid systems and perfectly suited to support this type of study.

Qualifications for both HGA and muGrid are provided in the reference material.

Aurora met with We Energies on 8/5/2021 to discuss the project and share the grant application. A letter of support has been requested but not received at time of submission. We will post to ERF when received. A letter if support has been received from WPPI which serves other Aurora facilities in Wisconsin.

Table 1: Project Team and Partners

Company	Role	Name
Advocate Aurora Health	Project Manager	Jedd Winkler
Advocate Aurora Health	Facilities representative	James Nash
HGA Architects and Engineers	Feasibility study technical lead	Cory Powers
muGrid Analytics	Microgrid modeling	Amy Simpkins
We Energies	Utility liaison	TBD

While this project will not directly impact Aurora equity efforts, it will create the potential to provide health care services during extended grid outages for communities of color and low-income communities. There is currently a 26-year gap in life expectancy across the communities served by Advocate Aurora which highlights the large health inequities in our communities. Our equity strategy goal is to increase life expectancy 5% in target low-income communities over a span of ten years.

3.4.3 PROJECT RESILIENCE OBJECTIVES AND METRICS

The project resilience objectives and metrics are as follows:

- 1) Maintain emergency loads for at least 96 hours without onsite fuel replenishment with 98% confidence
- 2) Maintain critical loads for at least 24 hours without onsite fuel replenishment with 98% confidence
- 3) Maintain basic facility operation and patient services for at least 30 days with no grid power
- 4) Utilize renewable energy resources during both grid connected and islanded operation
- 5) Leverage microgrid resources to reduce utility costs through multiple stacked revenue streams such as energy arbitrage, demand charge reduction, demand response and other grid interactive services, as available
- 6) Maintain EV charging capabilities during grid outage to support regional charging network during grid outage

As part of the feasibility study, the team would further refine the resilience objectives and metrics. The terminology used in the resilience objectives would also be more precisely defined. For example, items such as “emergency”, “critical” and “basic facility operation” would be further defined in conjunction with the project team, Aurora facility staff and emergency preparedness representatives.

3.4.4 EVALUATION OF SITE-SPECIFIC INFORMATION

As discussed previously, the Pleasant Prairie site includes over 200,000sq-ft of building space to serve a variety of health care services. The building is situated on 63 acres. A site plan has been included in the reference material.

The facility is in We Energies territory for both electricity and natural gas. The current site houses 2-600kW diesel generators to provide emergency power when the grid is down. The building heating is provided by natural gas fired hot water boilers. There is currently no solar PV located on site.

Our consultant has extensive experience working with municipalities and utilities as part of their typical building design process. All permitting requirements and potential barriers will be explored during the feasibility study, but at this time there are no barriers that would prevent that implementation of microgrid technology on site.

The site also houses a Charge Point EV charging station in the parking lot.

3.4.5 TECHNOLOGIES UNDER CONSIDERATION

The Pleasant Prairie microgrid study will evaluate a range of technologies. The core technologies of the microgrid will include a combination of roof and ground mount solar PV, lithium ion battery and generator. The study will evaluate fuel options for the generator including the evaluation of renewable fuels, diesel and natural gas.

The study will also evaluate the use of a combined heat and power system (CHP) to be incorporated into the microgrid. CHP systems are suited for buildings with 24/7 loads and year-round heating loads. In the case of a hospital complex, high airflow rates require large amounts of heating energy for both winter heating but also summer reheat as part of the outside air dehumidification process. Therefore, CHP may be an economic fit for this type of facility once the health complex is expanded.

The consultant will also evaluate the feasibility of an onsite electrolyzer to convert excess solar generation to hydrogen to be used as a fuel for either the CHP system, generator or the hydronic hot water boilers. As part of this evaluation, the consultant will determine if there are viable products available on the commercial market that can meet these requirements.

In lieu of onsite hydrogen production, the consultant will evaluate options to deliver green hydrogen onsite. This fuel would be used to potentially replace onsite fossil burning in either the boilers or generators as discussed above.

As the electricity grid rapidly shifts to renewable energy, the most significant challenge for Advocate Aurora is how to reduce emissions from building heating. Currently natural gas is the predominant heating source for the majority of their facilities. Aside from air source and ground source heat pump systems, there are limited options to retrofit existing heating systems off natural gas. Green hydrogen represents one potential emission free path for a drop-in replacement of natural gas. While the technology is still in its infancy, we believe this feasibility study is an appropriate place to start exploring options in this area. However, the detailed load and economic analysis will be focused on readily available technology.

3.4.6 COST MATCH

Aurora Health Care will be cost matching the study to with \$15k to the consultant fees and \$7,500 for internal personnel fees. We support the vision and see the need for a plan forward from #2 fuel generator resiliency plan to more sustainable technology sources. Grant funding is needed as the engineering skill level and cost of those resources is beyond our typical scope of projects. The grant availability has motivated our team to re-investigate the potential for microgrid application at our facilities. Without a feasibility engineering investigation into application and execution, the technologies remain an abstract plan.

In addition to consultant monetary match, these resources will be applied at varying levels during the duration of the study.

Facilities Director – North / Central WI
Energy Manager – Corporate
Facilities Director – Non-Acute / Ambulatory sites (WI)
Facilities Manager – Non-Acute / Ambulatory sites (South WI / Metro Milwaukee)
Facilities Supervisor – Non-Acute / Ambulatory sites (South WI)
Facilities Senior HVAC Technician – Non-Acute / Ambulatory (WI)
Sustainability Manager – Corporate

Optional resources that would be available–

Director of Financial Analysis
HVAC Manager corporate
Facilities Director
Vice President Finance, Ancillary Services
Senior Vice President Legal Department
Vice President Design and Construction
Other departments / specialties upon request

3.4.7 DATA COLLECTION PLAN

The existing facility has been in operation since November 2020 and a full year of utility data will be available during the feasibility study period, including 15-minute interval data for electricity and gas. In addition to the utility data, the proposed consultant was also the architect and engineer for the original project and has all drawings, specification and equipment data on file which will reduce the amount of time required for data collection and time required to become familiar with the site, increasing the time devoted to value add activities of the feasibility study. All data is available to complete the study within the grant period.

3.4.8 SYSTEM SIZING ANALYSIS

muGrid Analytics will perform the system sizing analysis using our proven Resilience First methodology. We will perform resilience and economic modeling, optimization, design sizing, and grid-connected dispatch strategy using our in-house, mathematical optimization platform, Redcloud. Redcloud is a best-in-class energy optimization tool validated against NREL's REopt and LBNL's DER-CAM.¹

Resilience modeling is still nascent across the industry. Many times, resilience performance is assumed to be deterministic – that there is a single number that defines resilience at a site, perhaps as an average or minimum operating duration. However, we view resilience performance as stochastic, and we will characterize it with both expected outage survival duration and probabilistic confidence levels. Resilience performance is dependent upon several stochastic variables, including, but not limited to weather, solar irradiance, cloud cover, time-of-day and time-of-year of the outage, and load at the facility. Some of these variables have characterizable but not fully predictable cross-correlation – solar conditions and building load may both be affected by the time of day or time of year of the outage, for example. But even if the relationships are characterized, the conditions at the beginning of an outage are never fully known enough to calculate a deterministic resilience duration. Therefore, we analyze multiple descriptors of resilience performance, including probability, or confidence, for a given duration.

We define resilience duration as the amount of time the microgrid can support its dedicated loads after a grid outage before the microgrid fails due to lack of power, whether that lack of power is caused by battery depletion, fuel depletion in the generator, or lack of solar irradiance. This is our primary resilience metric. Other important resilience metrics that may be considered include the time to recover of functionality after the first failure (usually enabled by solar power recharging the battery) and the amount of time the microgrid can then run following that recovery, or the secondary resilience duration. All duration values – time to first failure or primary resilience duration, recovery duration, and secondary resilience duration – must be paired with confidence levels in order to be valuable analysis results. The confidence values are not randomly distributed – they are highly correlated to season of year and load conditions at the building and may also be correlated to the time of day. Therefore, resilience performance is not presented as a deterministic number, but rather, as a full graphic capturing the dependency on these other variables. The following figures show the outputs of this resilience sizing and performance modeling at a similar hospital facility located elsewhere in the United States.

¹ Simpkins, Travis, and Carey O'Donnell. "Optimizing Battery Sizing and Dispatching To Maximize Economic Return." Battcon International Stationary Battery Conference. 2017.

Figure 2: Example time-to-first-failure heat map demonstrating stochastic resilience performance at every hour of the year.

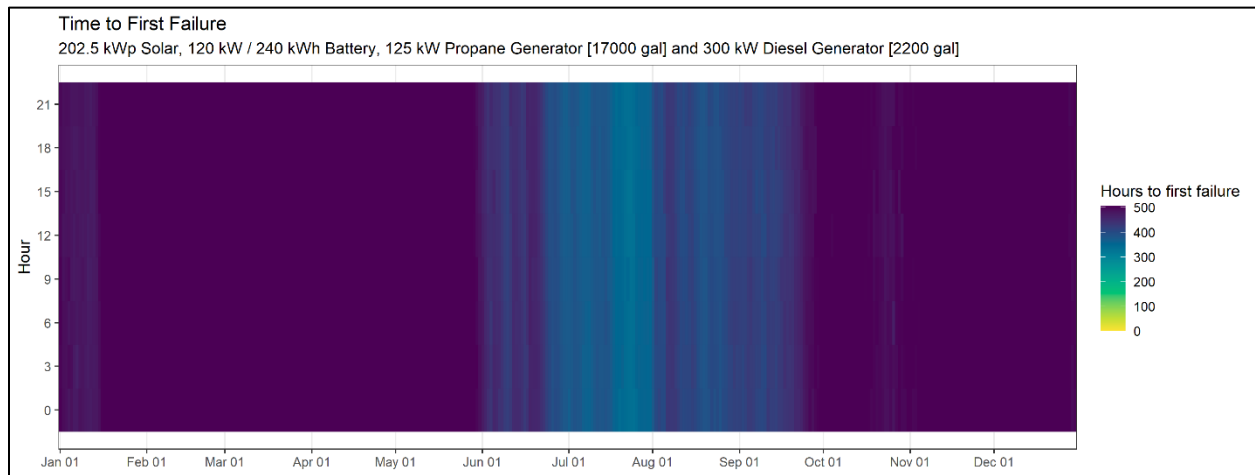
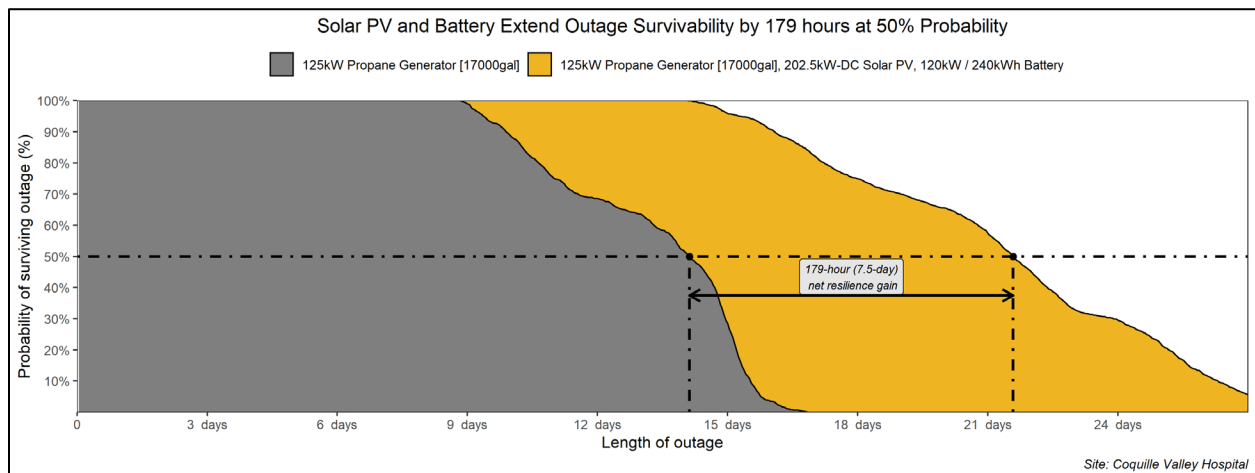


Figure 3 Example of microgrid improving resilience over fossil-fuel generator alone.



Outputs from the resilient capability sizing analysis will include visualizations similar to those above.

Based on the forecasted building loads, muGrid will determine the appropriate system sizing for the microgrid components to meet the following requirements:

- 1) Maintain emergency loads for at least 96 hours without onsite fuel replenishment with 98% confidence
- 2) Maintain critical loads for at least 24 hours without onsite fuel replenishment with 98% confidence
- 3) Maintain basic facility operation and patient services for at least 30 days with no grid power
- 4) Ability to utilize renewable energy resources during both grid connected and islanded operation

- 5) Ability to leverage microgrid resources to reduce utility costs through multiple stacked revenue streams such as energy arbitrage, demand charge reduction, demand response and other grid interactive services, as available
- 6) Maintain EV charging capabilities during grid outage to support regional charging network during grid outage

3.4.9 FINANCIAL ANALYSIS

As part of the techno-economic modeling, the consultant will provide detailed breakdown of the value stack of the proposed microgrid system accounting for both its grid connected and islanded services. The analysis will utilize actual utility tariffs to determine the economic benefits of the proposed systems. The individual value of the components would also be parsed out to better determine which are the most economic valuable components of the system, although we expect to find that the holistic system works in symbiosis so that the whole is greater than the sum of the parts.

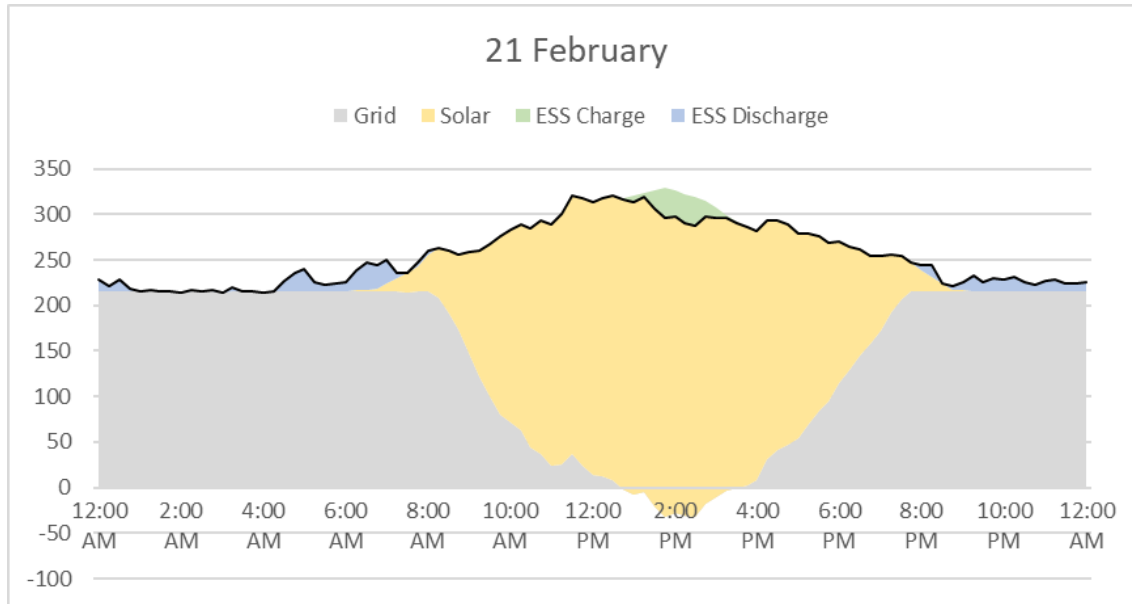
Once the microgrid system's storage and backup generation components are sized for resilience, we will perform an economic optimization using the building's load profiles, solar generation, and storage potential. The output of this optimization will be the optimized grid-connected dispatch strategy. For financial assessment we will determine the optimized grid-connected operations and calculate the stacked revenue streams, optimizing for the best value dispatch at every given time interval taking into account both costs and benefits. The mathematical optimization tool of choice is muGrid's Redcloud platform, which has been used to optimize microgrids across the US, including Wisconsin. The project team is also familiar with other best-in-class microgrid optimization tools, including NREL's REopt and LBNL's DER-CAM. The advantage of Redcloud is that we control the source code, and therefore may adapt the tool to the project, rather than the project to the tool. We will demonstrate utility bill savings based on saved energy charges from solar generation and self-consumption enabled by the BESS. We will also model any other revenue streams available as determined by the site's rate tariff and utility programs. Revenue streams may include but are not limited to peak shaving (on-site peak demand charge reduction), energy arbitrage (time-shifting solar), and demand response (responding to grid requests during network peaks.) Revenue streams may also include participation in ancillary services programs as available. We will perform techno-economic optimization for all technologies under consideration, including solar-plus-battery, CHP, and hydrogen.

The study would look at the potential value of enrolling in an interruptible load program. Aurora Advocate does participate in interruptible and demand response programs in the Illinois PJM market and has had successful experiences with these types of programs. Unfortunately, the local utility serving the Pleasant Prairie campus does not have any interruptible rates open to new accounts². We will work with the local utility to explore potential options to reopen access to these demand response and interruptible load programs as part of this feasibility study.

² <https://www.we-energies.com/services/business/load-management-programs>

The following figure shows an example optimized grid-connected dispatch strategy specifically targeting peak shaving as the primary revenue stream of interest at a similar hospital. This economic analysis demonstrated annual savings of over \$38,000 per year.

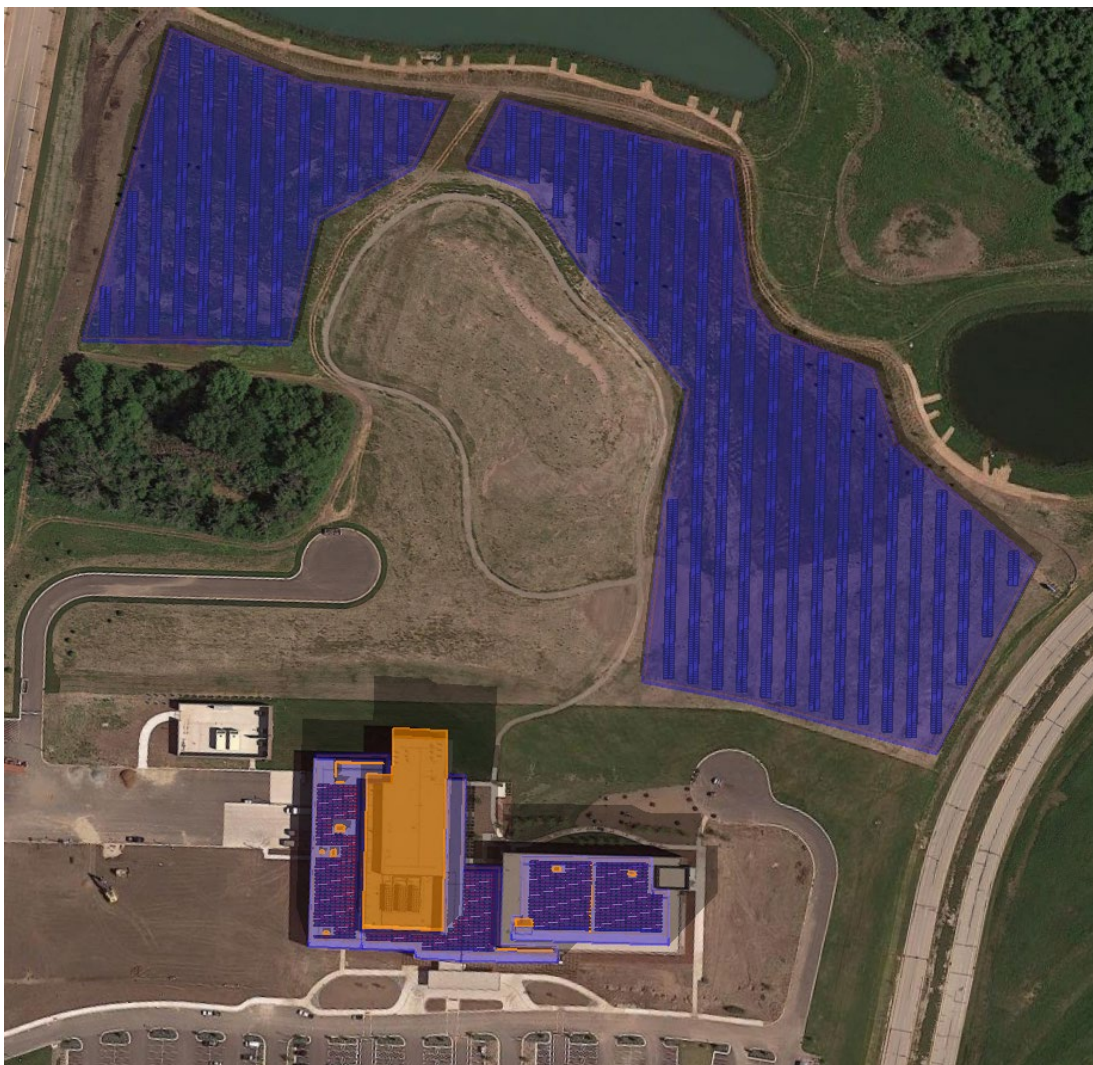
Figure 4: Example optimized grid-connected dispatch strategy at a similar hospital



3.4.10 ENVIRONMENTAL IMPACT

Through the feasibility study, the consultant will estimate the total environmental impact resulting from the implementation of the microgrid, including estimates by technology type. As part of the grant application, we have estimated the potential greenhouse gas savings based on some preliminary calculations and estimated solar PV system size. Based on a total installed capacity of 2.8MW of solar on a combination of both the roof and single axis tracking ground mount, the system would produce approximately 4,185,000 kWh/yr. Using the EPA greenhouse gas equivalency calculator, the solar PV aspect of the project would save 3,269 tons of GHG emission per year. Savings from the potential CHP and battery system would be estimated as part of the feasibility study.

Figure 5: Potential Solar PV Area at Existing Site



3.5 REFERENCE MATERIALS

Per application, additional reference materials not part of the 15 page limit are included below:

- 1.) Site satellite view
- 2.) Site plan
- 3.) Site Electrical 1-line
- 4.) Utility letter of support
- 5.) HGA Qualifications
- 6.) muGrid Qualifications

Figure 6: Site satellite view



GENERAL NOTES

1. THE BASE SURVEY WAS PREPARED BY PINNACLE ENGINEERING GROUP IN 2017. ALL UNDERGROUND UTILITIES AND STRUCTURES HAVE BEEN SHOWN TO A REASONABLE DEGREE OF ACCURACY AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THEIR EXACT LOCATION AND TO AVOID DAMAGE THERETO.
2. DETENTION PONDS LOCATED ON PROPOSED OUTLOTS ARE TO BE CONSTRUCTED AS PART OF THE PROJECT. REGIONAL POND DESIGN WILL BE COORDINATED WITH THE VILLAGE OF PLEASANT PRAIRIE FOR INCORPORATION OF REGIONAL STORM WATER CAPACITY IN ADDITION TO SITE SPECIFIC REQUIREMENTS.
3. LARGE, MATURE TREES TO REMAIN. UNDERGROWTH WILL BE REMOVED AND COORDINATED WITH THE VILLAGE OF PLEASANT PRAIRIE.

DATUM INFORMATION

VERTICAL DATUM: NGVD 29
HORIZONTAL DATUM: NAD 27

LAYOUT NOTES

1. THE BUILDING OUTLINES SHOWN ARE FOR REFERENCE PURPOSES ONLY AND SHALL NOT BE USED FOR STAKING PURPOSES. THE CONTRACTOR SHALL COORDINATE WITH THE ARCHITECT AND STRUCTURAL ENGINEER ON THE STAKING OF THE BUILDING.
2. SITE LIGHTS ARE SHOWN FOR REFERENCE PURPOSES ONLY AND THE CONTRACTOR SHALL REFER TO THE ELECTRICAL PLANS FOR DETAIL DESIGN INFORMATION. CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL ENGINEER ON STAKING OF THE SITE LIGHTS.
3. ALL DIMENSIONS SHOWN ARE TO THE EDGE OF PAVEMENT OR FACE OF CURB WHERE CONCRETE CURB IS SHOWN.
4. ALL PAVEMENT STRIPING SHALL BE WHITE IN COLOR.
5. REFER TO LANDSCAPING PLANS FOR SITE RESTORATION INFORMATION AND DETAILS.
6. ALL CURB RADIUS SHALL BE 4 FEET UNLESS SPECIFIED OTHERWISE.

LEGEND

- PROPOSED ASPHALT PAVEMENT (1) (C903)
- PROPOSED HEAVY DUTY ASPHALT PAVEMENT (2) (C903)
- PROPOSED CONCRETE SIDEWALK (5) (C903)
- PROPOSED LOADING DOCK CONCRETE PAVEMENT (4) (C903)
- PROPOSED CONCRETE PAVEMENT (3) (C903)
- PROPOSED VERTICAL CURB (9) (C903)
- PROPOSED VERTICAL HIGHSIDE CURB AND GUTTER (10) (C903)
- (R) -PROPOSED ADA RAMP WITH TRUNCATED DOMES

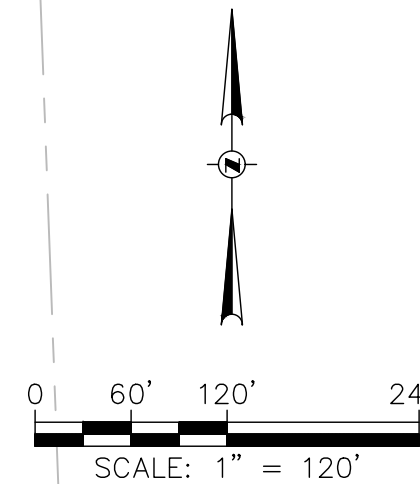
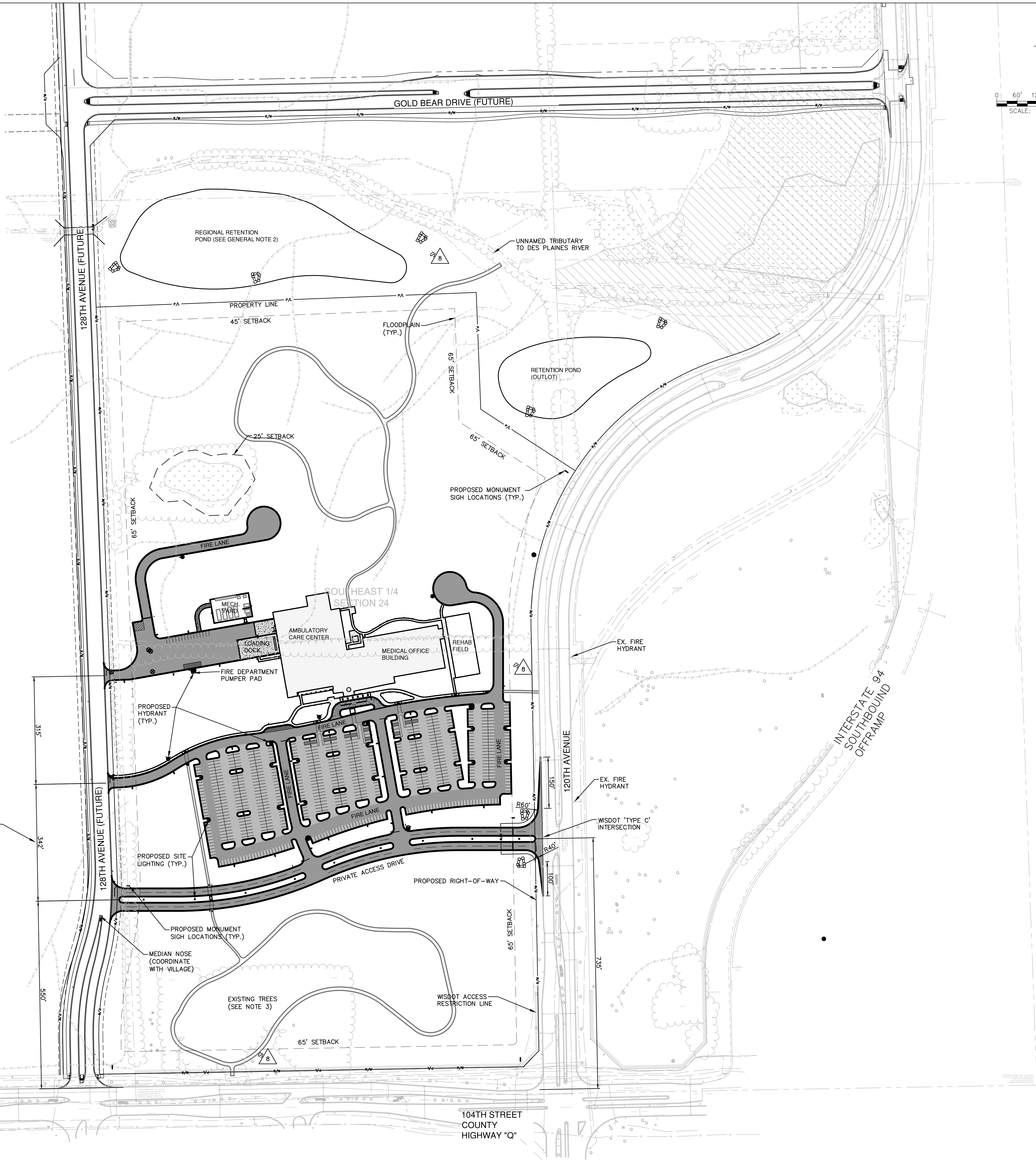
PARKING INFORMATION

TOTAL STALLS	716
TOTAL ACCESSIBLE	16

NOTICE:
In accordance with Wisconsin statute 182.0175, damage to transmission facilities, excavator shall be solely responsible to provide advance notice to the designated "ONE CALL SYSTEM" not less than three working days prior to commencement of any excavation required to perform work contained on this drawing, and further, excavator shall comply with all other requirements of this statute relative to excavator's work.

DISCLAIMER:
The underground utilities shown have been located from field survey information and existing drawings. GRAEF makes no guarantees that the underground utilities shown comprise all such utilities in the area, either in service or abandoned. GRAEF further does not warrant that the underground utilities shown are in the exact location indicated. GRAEF has not physically located the underground utilities.

DISTANCE BETWEEN DRIVEWAYS (TYP.)



HGA
333 East Erie Street
Milwaukee, Wisconsin 53202
Telephone 414.278.8200

BOLDT

Aurora
Health Care

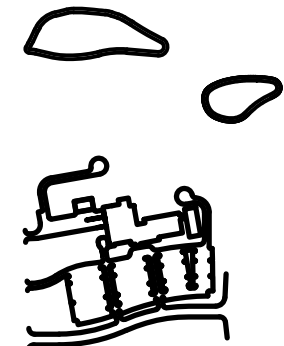
GRAEF

AURORA HEALTH
CENTER

PLEASANT PRAIRIE

AMBULATORY CARE
CENTER AND MEDICAL
OFFICE BUILDING

KEY PLAN



RECORD SET
12.18.2020

NO	DESCRIPTION	DATE
4	PACKAGE #4	11/09/2018
4	SI-08	01/17/2019

ISSUANCE HISTORY - THIS SHEET

HGA NO: 1373-026-00

OVERALL SITE
LAYOUT PLAN

DATE: JULY 26, 2018

PACKAGE #2

C200

August 3, 2021

Public Service Commission of Wisconsin
Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Administrator Nieto:

WPPI is pleased to provide this letter of support for the Advocate Aurora Health microgrid study.

The project application will support a stakeholder engaged process for evaluating and conducting a microgrid feasibility study. The team will study and identify potential deployment strategies for solar photovoltaics (PV), energy storage, and other microgrid technologies to strengthen resilience in the community. The study will also model and analyze load profiles, microgrid designs, and project costs/benefits. As a healthcare provider administering critical community services we believe they are an ideal candidate for this grant.

WPPI understands the value of this project and looks forward to contributing as a strategic and technical partner of the applicant.

Regards,



Jake Oelke, P.E.
Vice President – Energy Services

cc: Jedd Winkler, Energy Program Manager Facility Operations

From: Majszak, Cory
Sent: Thursday, August 5, 2021 10:55 AM
To: Ward, Jim L <Jim.Ward@wecenergygroup.com>
Subject: Letter of support-Microgrid grant

Jim,

Here's the grant application that we referenced in our meeting this morning.
We are seeking a letter of support from WE in our grant application.
Thank you.

Cory Majszak, MSOL, CHFM, CHOP
Director of Operations, Facilities
St. Luke's Medical Center
2900 W. Oklahoma Ave
Milwaukee, WI 53215
414.234.9226





HGA

ARCHITECTURE AND ENGINEERING QUALIFICATIONS

MICROGRIDS





ABOUT HGA

HGA is a national multi-disciplinary design firm rooted in architecture and engineering. Founded in 1953, we believe that enduring, impactful design results from deep insight into the people and passions that animate each unique environment. Nearly 800 people in eleven nationwide offices work to make a positive, lasting impact for clients. We re a catalyst for positive change—applying intelligent thinking and industry expertise to projects across all of our markets—from initial advisory services to working on design and operation projects.

Front Cover: HGA Madison (WI) Office | (nearly) Net Zero Energy Building



Our approach offers tools and documentation on the advantages, disadvantages and economics of key options to help you make informed and educated decisions. Whether tackling small projects like energy audits or designing significant new facilities, we are industry leaders in optimizing and implementing systems that best fits the current and future needs of our clients. We deliver reliable, resilient, effective, and sustainable infrastructure systems that are integrated into their environments.

WE ENABLE OUR CLIENTS TO:

- Reduce use of energy and resources, decreasing environmental impact and operating costs
- Protect financial resources by limiting exposure to energy market volatility
- Optimize current physical resources by assessing them for energy efficiency and reliability
- Seek LEED or other third party certifications



Arizona State University Student Pavilion | Tempe, AZ

A CLIMATE POSITIVE FUTURE WITH NET ZERO ENERGY

We are committed to meeting our clients' goals as well as challenging our industry. This means developing the expertise and research to push beyond net zero energy to net positive energy; from a neutral effect on health, safety, and resources to a positive one. As the need and desire for sustainable environments grow, so does the focus on high-performance buildings with sound data that we can share back with clients and our design teams.



Sutter Health Santa Rosa Regional Hospital | Santa Rosa, CA

HGA has design experience with various generation resources and energy storage—microgrid, combined heat and power, internal combustion engine generation, biomass facilities and biomass-based district energy systems, biodigesters, building mounted solar thermal and photovoltaics, photovoltaic building skin design, geothermal systems, wind generation, landfill gas, and more. Alternative equipment options can improve energy efficiency and reduce maintenance and operational costs. We consider the complexities of energy supply, energy generation, and building loads in the context of our clients' facility needs—present and future—and evaluate the feasibility and life-cycle cost of these alternatives to help owners justify the investment.

POTENTIAL PATHWAY TO NET ZERO ENERGY



PLANNING FOR A RESILIENT, RENEWABLE FUTURE

Our engineers have been partnering with clients to deliver creative, viable pathways to a cleaner, more resilient energy future for decades. Whether we leading assessments to explore solar PV applications with hydrogen energy storage systems or evaluating more traditional battery and thermal storage, we are industry leaders in optimizing and implementing systems that best fits the current and future needs of our clients.

HGA SUSTAINABILITY STATS

202

LEED PROJECTS
(CERTIFIED
& REGISTERED)

17

**NET ZERO ENERGY
PROJECTS**
(IN-PROGRESS, PLANNED
& COMPLETE)

01

**LIVING BUILDING
CHALLENGE**
(IN PROGRESS)

04

WELL PROJECTS
(CERTIFIED
& REGISTERED)

657

**PROJECTS REPORTED
TO ARCHITECTURE 2030**

TOP "ZERO ENERGY"
ARCHITECT

BY NEW BUILDING INSTITUTE

ARCHITECTURE 2030
INITIATIVE

FOUNDING SIGNATORY

NATIONAL
ENVIRONMENTAL
STEWARDSHIP

AWARD WINNER





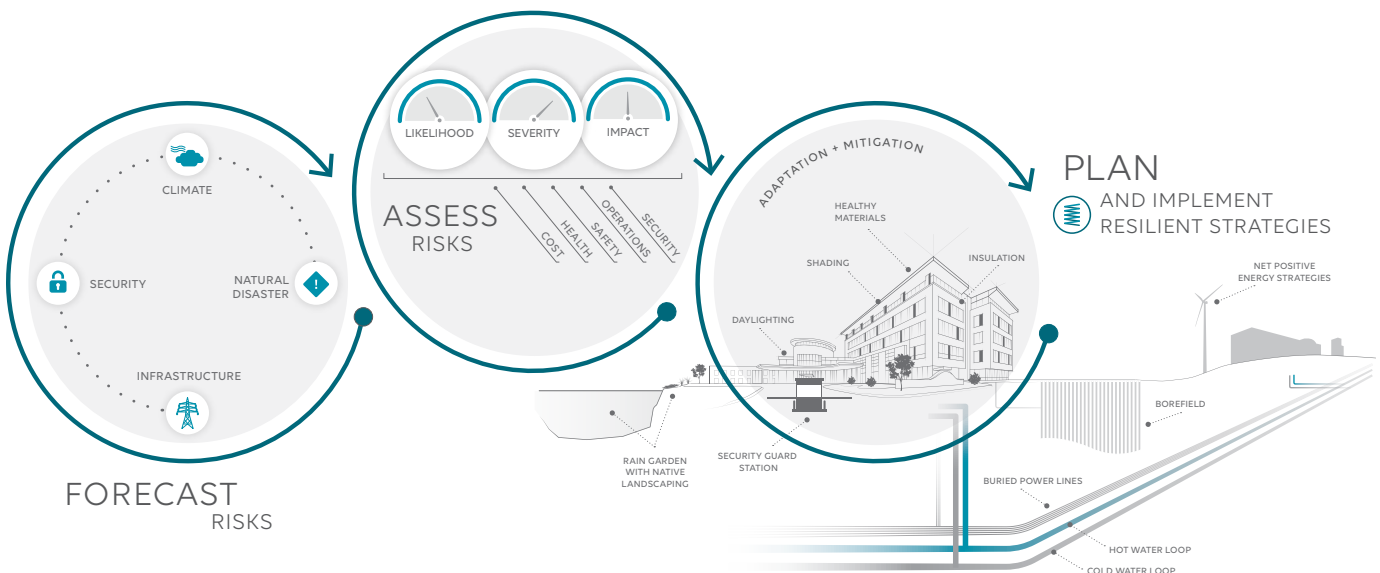
RENEWABLE ENERGY GENERATION SYSTEMS

Renewable energy generation systems hold the potential to reduce overall emissions, invest in local sources of energy, and reduce the lifecycle cost to operate facilities. However, even with renewable energy sources, the overall efficiency and associated emissions are linked to the proper operation of each facility. We evaluate energy consumption and provide specific recommendations that will optimize lifecycle costs for the facilities.

The viability of a Renewable Energy generation system varies significantly with building load profiles and site location. A building's peak load represents only a fraction of the total energy consumed annually. Therefore it is critical to evaluate all available energy sources at the site to optimize the size of the renewable energy generation system. HGA will consider the complexities of energy supply,

energy generation and building loads to evaluate the feasibility and costs of upgrading the existing infrastructure to meet current and future needs. We evaluate these solutions from a business planning perspective and find the optimal economic solution that meets reliability, environmental, and social requirements. Financial success is interwoven into development of our solutions from the beginning concepts through final design.

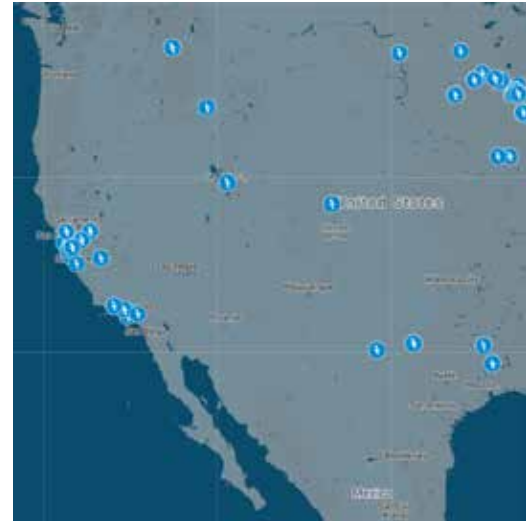
We consider energy in all of its forms: electricity, natural gas, chilled water, hot water, steam, solar, ground source heat pumps, woody biomass, food waste and animal waste. Planning for energy supply needs will help to manage the volatility in energy costs, communicate the emissions associated with energy consumed onsite, and reduce lifecycle costs. We consider energy supply in the context of energy demand from your facility needs—present and future.



HGA'S RESILIENCY PROJECTS



INSTALLED SOLAR PV PROJECTS



GENERATOR-O



Forest Edge Elementary School | First Net Zero School in the State of Wisconsin



ONLY PROJECTS



MICROGRID PROJECTS



HGA'S RECENT PROJECTS



OREGON SCHOOL DISTRICT | NEW NET ZERO ENERGY ELEMENTARY SCHOOL | OREGON, WI

HGA has worked with Oregon School District for the past ten years, providing a variety of energy consulting, commissioning, retro-commissioning and engineering design services—most recently, a new net zero energy (NZE) elementary school which creates a model for sustainability in the community. With NZE as a driving factor, HGA was engaged as a net zero energy/net zero carbon expert in order to help to achieve that goal. Our team provided energy consulting, energy modeling, and design services for renewable energy systems. We helped the district establish energy targets early in the design process to make sure efforts aligned with NZE “best practices”. The scope includes state-of-the-art energy efficiencies, such as a highly innovative system design for on-site microgrid/battery storage, a 740kW solar PV system, and a geothermal heating/cooling system. HGA is also providing commissioning to confirm the building is constructed to meet the design criteria and achieve the client’s goals for sustainability.



RAMSEY COUNTY | SOLAR FEASIBILITY ENGINEERING ANALYSIS | MAPLEWOOD, MN

Ramsey County wanted to install rooftop solar PV systems on existing County buildings to generate clean energy on-site and reduce greenhouse gas emissions. The feasibility study, performed by HGA, provided the documentation, strategies and tools needed to work toward their carbon reduction goals. The County identified a list of 20 buildings for the study, which evaluated roof conditions, site potential, structural capacity and existing electrical systems to identify “shovel-ready” sites for rooftop solar. In addition to assessing the existing conditions, the team estimated the cost for installing rooftop solar at those sites, and performed solar analysis using modeling software to determine kWh production and estimate the annual solar generation. Six buildings were identified as shovel-ready with roof areas that will allow for a cumulative 647 kW (dc) of photovoltaic capacity, or 600 kW (ac). Average electric production from these 6 photovoltaic arrays would generate 835,700 kWh annually, and would help the County avoid 716,195 lbs CO₂e annually, or 325 metric tons CO₂e. In addition, the County can benefit from reduced utility costs, enhanced resiliency, and an increase in the region’s capacity for clean energy generation.



PINCANNARX | COMMISSIONING FOR HEADHOUSE AND GREENHOUSE | PINCONNING, MI

Pincanna RX is a licensed cannabis grower and processor in Michigan. The new Pinconning facility is a headhouse and greenhouse in a remote area of Michigan. Due to significant power demand for grow lights, the facility is designed to generate all of its own power and will not be connected to the electric utility. This project includes natural gas combined heat and power (CHP) units totaling 2.6 MW. Since the growing operation is inside, the HVAC system needs to tightly control airflows, temperature, humidity and CO2 concentrations for plants to thrive. To supplement indoor CO2 concentrations, a scrubber cleans the exhaust from

the CHP generators and supplies the carbon dioxide to the plants to support growth. This improves energy efficiency and reduces the environmental impacts from this operation.

HGA led the commissioning process and developed performance testing procedures to verify the building systems, particularly the mechanical and electrical systems, are operating per design. Given the significant interactions between electrical equipment and mechanical systems, HGA's operational focus helped the design team and contractors finalize sequences of operation, switching, and programming for scenarios where a generator or load goes offline (Demand Response programming).



WISCONSIN AIR NATIONAL GUARD | ENERGY RESILIENCY PROJECT & MICROGRID | MILWAUKEE, WI

Kevin Standlee (HGA) began this project by documenting and analyzing the existing electrical infrastructure and load information for the 89-acre base. From there, he developed a concept design that reconfigures services, incorporates an existing 2.25MW solar field, 1MW of new energy storage and multiple networked emergency generators all tied together on a microgrid controls network. This concept design will



DANE COUNTY | HIGHWAY FACILITY | MADISON, WI

The new Highway Facility Building includes 150 kW of photovoltaic panels, and houses maintenance equipment and administrative office space for the Dane County Highway Department. HGA provided energy modeling for cost effective design choices, a feasibility study for solar



HGA

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muGrid Analytics Statement of Qualifications

muGrid Analytics LLC solves wicked problems at the intersection of energy and economics using math and modeling. We provide bankable techno-economic optimization of renewable energy, energy storage, and microgrids to project developers, financiers, component manufacturers, utilities, and property owners. With a one-two punch of in-depth experience in the new energy industry and in the modeling, design, and operation of complex technical systems, muGrid provides comprehensive, data-driven advisory and design services to a wide range of energy stakeholders throughout the project life cycle. muGrid was founded by Dr. Travis Simpkins, who previously architected and developed the microgrid modeling capabilities for the National Renewable Energy Laboratory, including the REopt platform.

Sitting at the intersection of technology and finance, muGrid Analytics is uniquely positioned to not only help clients understand how distributed energy technologies work, but also how they will make or save money. muGrid has developed the proprietary Redcloud energy optimization platform which is used to optimize energy generation and consumption at buildings, campuses, feeders, networks, and bases such that clients meet their energy resilience and sustainability goals at minimum life cycle cost. Because muGrid has developed the Redcloud model in-house, we can customize it to reflect the subtleties of each client's particular situation. Redcloud is particularly well suited to energy storage optimization as it can be tailored to consider multiple, stacked revenue streams which are often available to dispatchable assets.

muGrid has also revolutionized resiliency modeling and characterization, embracing the stochastic nature of resilience, and enabling higher-fidelity models. We have characterized the resilience performance of traditional fuel-based generation and assessed how solar+storage symbiotically combine with fuel-based generation to provide superior outage duration survivability at high confidence while providing economic benefits in grid connected mode. muGrid operates in alignment with their core values. They are more than just words on a page – these values are the guiding principles that form the foundation of muGrid's approach to work.

- ***Integrity.*** In a world where everybody is trying to sell you something, muGrid isn't interested in getting you anything but the truth. They want you to make decisions that are going to be best for you and to get you the results you need and desire. And that's the truth.
- ***Curiosity.*** muGrid is always open to exploring, always open to trying something new, always looking for ways to serve clients better. Sometimes that means trying out new technology. Sometimes it looks like building custom models for individual clients. But it's always about digging deep into clients' true needs, even if they aren't able to articulate them clearly at first.
- ***Agility.*** muGrid works with low overhead and moves fast. They are ready when you are to create momentum for your project.
- ***Collaboration.*** muGrid works in 360° collaboration. That is, they treat clients, partners, and subcontractors as teammates and not commodities. The team is all in this together, and the more brain power combined, the better the solution will be.

The muGrid team prides themselves on providing technology-agnostic, independent analysis and advisory services to help their clients build the right energy systems and then operate those systems to best advantage. They do this by critically listening to client needs and providing tailored, innovative solutions that fulfill those needs.

Key Personnel

Amy Simpkins – CEO

Amy Simpkins has over 15 years of experience in technical engineering and project management of complex systems and software. She is Chief Executive Officer at muGrid Analytics.

Prior to joining muGrid, Amy was an engineer and spacecraft systems architect with Lockheed Martin, where she worked on advanced R&D and design integration for earth observing and manned spacecraft. In this capacity, she assessed architectural choices based on design performance, operational power constraints, and program finance. Amy also spent several years in flight operations for unmanned scientific exploration spacecraft, where she helped monitor and manage the solar array performance, energy storage systems, and power budgets of long duration deep space missions. Her technical expertise includes system and software architecture, system-level performance modeling, and design tradespace analysis.



Amy has coached and consulted on product innovation, business strategy, marketing, and sales for startups and small businesses in the renewable energy, healthcare, and SaaS sales spaces. She is an internationally recognized speaker on innovation and integration for entrepreneurs and is author of the book, *Spiral: A Catalyst for Innovation and Expansion*. She holds an MS in Astronautical Engineering from the University of Southern California and an SB in Aeronautics and Astronautics from the Massachusetts Institute of Technology.

Travis Simpkins, PhD – CTO

Dr. Travis Simpkins has over 20 years of experience in the design, modeling, and simulation of complex systems. He is the Chief Technology Officer at muGrid Analytics.

Though he was formally trained as integrated circuit designer, he has spent most of the past decade helping to solve the world's energy challenge. He joined the National Renewable Energy Laboratory in 2010 and proceeded to reinvent their approach to modeling



renewable energy systems. Eschewing emotion for data, he pioneered a purely quantitative approach to analyzing and optimizing the costs and benefits of solar, wind, biomass, waste-to-energy, and other renewable technologies. His innovative research in this field led to him creating the REopt tool.

Travis holds a SM and PhD in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology, a certificate of Financial Engineering from the MIT Sloan School of Management, and a BS in Electrical Engineering and Applied Physics from Case Western Reserve University. He is a Senior Member of the IEEE and has published numerous papers in the fields of energy system optimization, applied optics, and integrated circuits.

muGrid Project Experience

muGrid has conducted economic and resilience analysis and design studies for microgrids at hundreds of public and private sites across the US and around the world. A few examples of those projects follow.

*Microgrid Development for a Native American community in northern Wisconsin; April 2019
3 Facilities, 520 kW solar PV, 1 MWh BESS*

muGrid Analytics is a proud member of the technical team that won a Department of Energy grant for energy projects on tribal lands.¹ muGrid did the system sizing and preliminary design for three solar plus storage systems at three separate tribal facilities that will provide both resilience and economic benefits to the tribe. muGrid will also provide M&V and ongoing advisory services to the tribe. System commissioning is scheduled for April 2021.

Microgrid Development for Cimarron District Forestry Office, New Mexico; 2018-2019.

muGrid Analytics performed a feasibility study and preliminary design for a backup power system at a remote forestry command post. The post is critical infrastructure during wildfire events. The system was built and commissioned in 2019.² This project was done in partnership with Clean Energy Group and American Microgrid Solutions.

Economic solar plus storage solutions for a large tin mine in Peru with a 15 MW load

muGrid Analytics assessed the impacts of replacing diesel generation with solar plus storage for the purposes of reducing utility expenses on a complex rate tariff in Peru. muGrid worked with the client to develop a phased implementation plan and provided analysis on cost-benefits at each proposed stage of project development.

Remote 200 kW hybrid solar-storage-diesel microgrid for a national gas company in LATAM

muGrid Analytics designed and analyzed a hybrid microgrid solution for a remote islanded location for a gas company in Latin America.

¹ <https://www.energy.gov/nepa/downloads/cx-101560-ishkonige-nawadide-solar-project>

² <https://www.cleangroup.org/ceg-projects/resilient-power-project/featured-installations/cimarron-forestry-office/>

*Municipal and Commercial Resilient Power Portfolio in the Pacific Northwest; 2020
22 facilities; 2.5 MW solar PV, 5.2 MWh BESS, 1.8 MW fossil fuel based generation*

muGrid Analytics is assisting a state-level organization in its efforts to design and fund resilient power systems across the state at critical commercial and municipal facilities. Motivated by the threat of natural disasters such as earthquakes and wildfires, the state is using our analysis to close the funding gap and ensure that critical infrastructure is available to support citizens during emergency conditions.

50MW Solar Farm in Virginia; 2019

muGrid Analytics provided detailed, investment-grade financial analysis for a utility-scale solar farm, wheeling power across PJM. The project is currently in final negotiations with offtakers and utilities.

2.7 MW Commercial Solar + Storage with EV Charging in Colorado; November 2018

muGrid Analytics assessed the feasibility, configuration, and operational strategy for a suite of office buildings in Colorado. The office buildings are about to offer EV charging as a service to tenants, and wanted to assess the impact of charging on their load and mitigate utility bill impacts by augmenting with solar and on-site storage. muGrid used the Redcloud energy optimization platform to conduct techno-economic analysis and provide recommendations on system sizing, project economics and financing, and EV charging strategy. This project was done in collaboration with Rio Grande Renewables.

Maryland Municipality Smart Cities Initiative Microgrid Project; July 2018

muGrid worked with a municipality in Maryland to assess and design a microgrid for several city and public works buildings as part of the Smart City initiative. The city was able to show that 93% of electricity needs would be generated by solar, and emergency power resilience would be provided by a combination of solar, battery storage, and natural gas generator. This project was done in collaboration with Clean Energy Group.

200MW Utility Solar + Storage in Mexico; October 2018

In the Fall of 2018, muGrid Analytics was contracted to determine the economically optimal dispatch strategy for a 200 MW solar plus storage system that would result in the maximum annual revenue to the owner, assuming that an hourly PPA price over the lifetime of the contract. muGrid used their Redcloud energy optimization platform to analyze three solar sizes and multiple battery sizes at each of two sites.

5 MW Solar + Storage + Diesel Minigrid in DR Congo; August 2017

In the Spring of 2018, muGrid Analytics performed a techno-economic feasibility analysis and conceptual design for a 5 MW solar + battery storage + diesel generation facility in the Democratic Republic of the Congo. The analysis determined the economically optimal size of storage to pair with the 5 MW-dc solar, as well as the projected dispatch strategy that would maximize the NPV of the project to the owner. Stochastic analysis was used to characterize the production of the plant and result

financial return that would have occurred during each of the past 25 years using historical weather data for the location.

Microgrid Development for Red Cliff Band of Lake Superior Chippewa, Wisconsin; February 2018

The Red Cliff Band desires first to improve their energy economics and enhance community energy resiliency with the construction of microgrids, and then to eventually form their own Tribal Utility Authority (TUA) as an alternative to buying power from their local utilities. muGrid performed extensive analysis on three candidate microgrid sites (3 MW total) and provided guidance on the master site plan for the tribe's community. muGrid partnered with Chequamegon Bay Renewables and Baker Tilly on this effort. As of this writing the preliminary design phase is complete, and the project is waiting for state and federal funding to move forward.

Microgrid Development for Quinault Indian Nation, Washington; April 2018

The Quinault Indian Nation, located on Washington's Olympic Peninsula, has significant concerns about energy resiliency in case of natural disaster—rising sea levels threaten their oceanside community. They wish to own their own DERs and control their own microgrid. muGrid performed analysis and provided advisory services to help the stakeholders understand the scope of the solar plus storage project (800 kW) and possible technology configurations. muGrid partnered with Bonneville Environmental Foundation on this effort.

Department of Energy, Solar in Your Community Challenge; April 2017

The Solar in Your Community Challenge is a \$5 million competition sponsored by the U.S. Department of Energy's (DOE) SunShot Initiative. The goal is to expand solar access to underserved segments, specifically low- and moderate-income communities; non-federal governments (i.e. state, local, and tribal); and non-profit organizations. The Challenge supports the creation, demonstration, and scaling of innovative, replicable, and sustainable business and financial models that can successfully unlock solar access to these underserved groups. muGrid Analytics was a featured Technical Consultant to the challenge and provided consulting, analysis, and design services for seven teams, many of whom have become repeat clients outside the challenge.

Feasibility of a 20 MW Combined Heat and Power (CHP) Plant for Old Souls Farm; January 2018

In Winter 2018, muGrid Analytics completed a feasibility analysis of a 20 MW natural gas-fired combined heat and power plant for an indoor agricultural facility in Ohio. The analysis determined the optimal system sizing, operating strategy, and projected financial return that maximized ROI to the owner across five stacked revenue streams: 1.) avoided energy charges, 2.) avoided demand charges, 3.) avoided heating costs, 4.) participating in PJM capacity markets by both reducing onsite load and net exporting power during the PJM five peak hours, and 5.) CO₂ recovery for plant growth.

Validation of Battery Storage Economics for Hawaii Green Infrastructure Authority (HGIA); March 2018

In 2015, the State of Hawaii was the first in the nation to set an ambitious goal of adopting a 100% Renewable Portfolio Standard (in the electricity sector) by 2045. HGIA was created by the state legislature to make clean energy investments accessible and affordable to a broader cross-section of Hawaii's utility ratepayers, with a portion of its funds to benefit underserved communities, low- and moderate-income households, renters and nonprofits. To support this work, muGrid is developing customer profile standards and customized analytical tools to support and promote the proliferation of renewable energy sources among Hawaii residents and small business.

Resilient Power Project – Clean Energy Group (2017-present)
27 facilities to date; 3.7 MW solar PV, 14.3 MWh BESS

Clean Energy Group's Resilient Power Project aims to bring clean, reliable power to nonprofits low-to-moderate income housing. The team of muGrid Analytics and American Microgrid Solutions has performed multiple feasibility studies for the Resilient Power Project ranging from senior care facilities, to public works buildings, to LMI multi-family housing.

Portfolio Analysis of Solar + Storage for a Multifamily Housing REIT – AvalonBay Communities, 2017

AvalonBay is the second largest exchanged-listed apartment real estate investment trust (REIT) in the US with multi-family housing communities on both the east and west coasts. muGrid Analytics, in collaboration with our partners, is helping AvalonBay develop solar projects across their portfolio as part of their commitment to sustainability. muGrid Analytics used big data techniques and our Redcloud energy optimization platform to efficiently analyze over 280 communities in the AvalonBay portfolio for solar and storage potential.

Economic Optimization of 3 MWh Battery – San Diego Gas & Electric; 2015

In 2015 while at the National Renewable Energy Laboratory, Dr. Simpkins led the analysis of a 1 MW – 3 MWh battery for San Diego Gas & Electric. The primary application of the battery was to perform PV smoothing on a feeder that was saturated with solar. The analysis determined the maximum annual revenue that could be derived by participating in the CAISO ancillary service markets and performing energy arbitrage at the nodal LMPs when the battery was not needed for PV smoothing.

Prior experience

Dr. Travis Simpkins performed analysis and advisory services for a significant number of Department of Defense (DoD), civil government, and large campus projects during his tenure at NREL. He also architected and led the development of the REopt energy modeling tool which has been used to evaluate renewable energy options at 1000's of sites, including most of the DoD bases in the United States and around the world. A select list of military microgrids that he has advised on include:

- Fort Carson, Colorado
- Joint Base Pearl / Hickam, Hawaii
- Beale AFB, California
- Pacific Missile Range Facility, Kauai
- Marine Corps Air Station Miramar, California

- Otis Air National Guard Base, Cape Code, Massachusetts
- Fort Hunter Liggett, California
- Crane NSA, Indiana

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